REMARKS

Rejections Relying on 35 U.S.C. § 102(e)

Applicant notes that certain references used in support of rejections rely on 35 U.S.C. § 102(e). In responding to the rejections, Applicant does not admit that the references are prior art and Applicant specifically reserves the right to swear behind these references at a future date.

Claims 1-4, 6, 7, 9-11, 13-18, 41 and 51

Applicant notes that claims 1-4, 6, 7, 9-11, 13-18, 41 and 51 are indicated to be rejected in the Office Action Summary, but that no art-based rejection or other reasoned basis for rejection is provided within the body of the Office Action. Accordingly, no clear issue has been developed between the Examiner and Applicant as to these claims. Applicant thus contends that a subsequent Office Action cannot be made final. *See* MPEP § 706.07.

Claim Rejections Under U.S.C. § 103

Mui et al. in view of Hause et al.

Claims 5, 8, 12, 19-40, 42, 50, and 52-56 were rejected under 35 U.S.C. § 103(a) as being unpatentable over Mui et al. (U. S. Patent No. 6,235,643) in view of Hause et al. (U. S. Patent No. 6,051,863). Applicant respectfully traverses.

The Office Action states that Mui et al. teaches "plasma-etching with fluorine containing gas in addition to a selection from bromine containing gas and or iodine containing gas (col. 17 lines 1-8) . . . ." Upon a careful review of the Mui et al. reference, Applicant contends that Mui et al. does not teach or suggest use of an iodine-containing gas in any of its plasmas. Furthermore, the Office Action admits that Mui et al. and Hause et al. fail to teach etching with an iodinate etching gas. Office Action, page 3, section 7. The Office Action further states that Mui et al. teaches that its bromine-containing gas can be selected from "hydrogen bromide, bromine-substituted fluorocarbon, bromotrifluoromethane and bromine-substituted hydrofluorocarbon . . . ." Applicant further contends that Mui et al. does not teach or suggest use

of any bromine-containing gas other than hydrogen bromide (HBr). Furthermore, Mui et al. appears to utilize the HBr as a hydrogen source. *See, e.g.,* Mui et al., column 3, lines 20-21 ("Examples of hydrogen sources other than hydrogen gas include HBr . . . ."); column 15, lines 50-51 ("Examples of hydrogen sources include H_2, HBr . . . .").

Claim 1 recites, in part, "wherein a content of the at least one element is sufficient to produce a taper angle of the sidewalls of greater than about 87°." Mui et al. does not teach or suggest controlling a bromine or iodine content in order to produce a taper angle of the sidewalls of a silicon oxide layer of greater than about 87°. Mui et al. only appears to concern itself with the taper within its silicon substrate, not its silicon oxide adhesion layer. Accordingly, Mui et al. does not teach or suggest each and every element of claim 1. The secondary reference of Hause et al. fails to overcome this deficiency of the Mui et al. reference. As claims 5, 8 and 12 depend from and further define patentably distinct claim 1, these claims are also believed to be allowable. Accordingly, Applicant contends that claims 5, 8 and 12 are patentably distinct from the cited references, either alone or in combination.

Claim 19 recites, in part, "generating a plasma containing fluorine and iodine." As noted above, Mui et al. does not teach or suggest a plasma containing iodine. Accordingly, Mui et al. does not teach or suggest each and every element of claim 19. The secondary reference of Hause et al. fails to overcome this deficiency of the Mui et al. reference. Accordingly, Applicant contends that claim 19 is patentably distinct from the cited references, either alone or in combination.

Claim 20 recites, in part, "absorbing components from the plasma on the sidewalls of the silicon oxide layer, wherein the absorbed components are selected from the group consisting of bromine-containing components and iodine-containing components and wherein the absorbed components are sufficient to passivate the sidewalls of the silicon oxide layer from attack by fluorine-containing components of the plasma" and "continuing to advance the etch front until a desired aspect ratio is attained, wherein the desired aspect ratio is greater than about 8:1." Applicant has taught that high aspect ratios are difficult to obtain using conventional etching, and that by absorbing bromine- or iodine-containing components on the sidewalls of the aperture, a

sufficiently high taper angle may be achieved without coincident bowing resulting from free fluorine. While Applicant acknowledges that Mui et al. does purport to etch a silicon oxide layer using a plasma containing a fluorine-containing gas and a bromine-containing gas, there is no teaching or suggestion that its process could be carried out until the aspect ratio is greater than about 8:1. This failure of the Mui et al. reference is admitted by the Office Action. *See, e.g.,* Office Action, page 3, section 7 ("The Mui/Hause et al. reference . . . lacks . . . the aperture aspect ratio is greater than 5:1, and 8:1 . . . ."). In fact, Mui et al. purports only to be interested in breaking through the silicon oxide layer and teaches that subsequent etching use a different etch chemistry. *See, e.g.,* Mui et al., column 2, lines 25-28 ("Subsequent to the break-through step, a trench is etched to a desired depth in the silicon substrate using a different plasma feed gas composition."). Accordingly, Applicant contends that Mui et al. does not teach or suggest that absorbing sufficient bromine- or iodine-containing components to passivate the sidewalls of the silicon oxide layer from attack by fluorine-containing components of the plasma sufficient to produce an aspect ratio of greater than about 8:1. Applicant thus contends that claim 20 is patentably distinct from Mui et al. The secondary reference of Hause et al. fails to overcome these deficiencies of the Mui et al. reference. As claims 21-24 depend from and further define patentably distinct claim 20, these claims are also believed to be allowable. Accordingly, Applicant contends that claims 20-24 are patentably distinct from the cited references, either alone or in combination.

Claim 25 is believed to be patentably distinct from Mui et al. for the reasoning provided with respect to claim 20. Mui et al. does not teach or suggest that its process can be utilized to produce an aperture in a silicon oxide layer having an aspect ratio of greater than about 8:1. The secondary reference of Hause et al. fails to overcome this deficiency of the Mui et al. reference. As claims 26 and 27 depend from and further define patentably distinct claim 25, these claims are also believed to be allowable. Accordingly, Applicant contends that claims 25-27 are patentably distinct from the cited references, either alone or in combination.

Claim 28 is believed to be patentably distinct from Mui et al. for the reasoning provided with respect to claim 19. Mui et al. does not teach or suggest that its plasma can contain at least

one iodine-containing gas. The secondary reference of Hause et al. fails to overcome this deficiency of the Mui et al. reference. Accordingly, Applicant contends that claim 28 is patentably distinct from the cited references, either alone or in combination.

Claims 29 and 37 are believed to be patentably distinct from Mui et al. for reasoning similar to that provided with respect to claim 20. Mui et al. does not teach or suggest that its process can be utilized to produce an aperture in a silicon oxide layer having an aspect ratio of greater than about 5:1. This failure of the Mui et al. reference is admitted by the Office Action. *See, e.g.,* Office Action, page 3, section 7 ("The Mui/Hause et al. reference . . . lacks . . . the aperture aspect ratio is greater than 5:1, and 8:1 . . . ."). The secondary reference of Hause et al. fails to overcome this deficiency of the Mui et al. reference. As claims 30-36 depend from and further define patentably distinct claim 29, and claim 38 depends from and further defines patentably distinct claim 37, these claims are also believed to be allowable. Accordingly, Applicant contends that claims 29-38 are patentably distinct from the cited references, either alone or in combination.

Claim 39 is believed to be patentably distinct from Mui et al. for the reasoning provided with respect to claim 19 and reasoning similar to that provided with respect to claim 20. Mui et al. does not teach or suggest that its plasma can contain at least one iodine-containing gas. Furthermore, Mui et al. does not teach or suggest that its process can be utilized to produce an aperture in a silicon oxide layer having an aspect ratio of greater than about 5:1. The secondary reference of Hause et al. fails to overcome these deficiencies of the Mui et al. reference. As claim 40 depends from and further defines patentably distinct claim 39, this claim is also believed to be allowable. Accordingly, Applicant contends that claims 39 and 40 are patentably distinct from the cited references, either alone or in combination.

Claim 41 recites, in part, "generating a plasma comprising at least one first source gas, wherein each at least one first source gas is a fluorocarbon gas" and "adding at least one second source gas to the plasma while continuing to advance the etch front, wherein each at least one second source gas contains an element selected from the group consisting of bromine and iodine." Applicant contends that Mui et al. does not teach or suggest such modification of the

plasma through the addition of a second source gas containing bromine or iodine while advancing the etch front. Mui et al. purports to change the plasma chemistry only after break-through has occurred in its silicon oxide layer. The secondary reference of Hause et al. fails to overcome this deficiency of the Mui et al. reference. As claim 42 depends from and further defines patentably distinct claim 41, this claim is also believed to be allowable. Accordingly, Applicant contends that claim 42 is patentably distinct from the cited references, either alone or in combination.

Claim 49 recites, in part, "generating a plasma comprising at least one first source gas, wherein each at least one first source gas is a fluorocarbon gas" and "adding at least one second source gas to the plasma while continuing to advance the etch front, wherein each at least one second source gas is a bromine-containing gas." Applicant contends that Mui et al. does not teach or suggest such modification of the plasma through the addition of at least one second source gas, with each second source gas being a bromine-containing gas, while advancing the etch front. Mui et al. purports to change the plasma chemistry only after break-through has occurred in its silicon oxide layer. The secondary reference of Hause et al. fails to overcome this deficiency of the Mui et al. reference. As claims 50 and 52 depend from and further define patentably distinct claim 49, these claims are also believed to be allowable. Accordingly, Applicant contends that claims 50 and 52 are patentably distinct from the cited references, either alone or in combination.

Claim 53 recites, in part, "generating a plasma comprising at least one first source gas, wherein each at least one first source gas is a fluorocarbon gas" and "adding at least one second source gas to the plasma while continuing to advance the etch front, wherein each at least one second source gas is a iodine-containing gas." Applicant contends that Mui et al. does not teach or suggest an iodine-containing plasma in use with its process. Accordingly, Applicant contends that Mui et al. does not teach or suggest a modification of the plasma through the addition of at least one second source gas, with each second source gas being a iodine-containing gas, while advancing the etch front. Mui et al. purports to change the plasma chemistry only after break-through has occurred in its silicon oxide layer. The secondary reference of Hause et al. fails to

overcome this deficiency of the Mui et al. reference. As claims 54-56 depend from and further define patentably distinct claim 53, these claims are also believed to be allowable. Accordingly, Applicant contends that claims 53-56 are patentably distinct from the cited references, either alone or in combination.

Mui et al., in view of Hause et al., and further in view of Wong et al.

Claims 5, 8, 12, 19-40, 42, 50, and 52-56 were rejected under 35 U.S.C. § 103(a) as being unpatentable over Mui et al., in view of Hause et al., and further in view of Wong et al. (U. S. Patent No. 5,874,362). Applicant respectfully traverses.

Applicant contends that it has shown the claims to be patentably distinct from the combination of Mui et al. in view of Hause et al. as detailed in the foregoing section.

Wong et al. purports to disclose a process for etching single crystal silicon, polysilicon, silicide and polycide using iodinate or brominate gas chemistry. As such, Applicant contends that it is inapplicable to Applicant's claimed methods of forming apertures in silicon oxide materials. Therefore, it is improper to combine Wong et al. to modify Mui et al. and Hause et al. as applied in the rejection.

Even if combination were proper, which Applicant denies, the combination would suggest modification of Mui et al.'s trench formation in its silicon substrate and not the break-through etch of its oxide layer. Accordingly, the combination would still fail to teach or suggest each and every element of Applicant's claims.

In addition, Applicant contends that Wong et al. expressly teaches away from the use of its etch chemistry for etching silicon oxide materials. *See, e.g.,* Wong et al., column 5, lines 21-22 ("Etch selectivity to oxide is excellent."); column 10, lines 8-9 ("a selectivity of near infinity for the oxide mask material . . . .").

In view of the foregoing, Applicant respectfully submits that Wong et al. fails to overcome the deficiencies of the Mui et al. and Hause et al. references. Accordingly, as claims 5, 8, 12, 19-40, 42, 50, and 52-56 were shown to be patentably distinct from the combination of Mui et al. and Hause et al., Applicant contends that claims 5, 8, 12, 19-40, 42, 50, and 52-56

remain patentably distinct from the combination of Mui et al., Hause et al. and Wong et al.

Prior Art Made of Record and Not Relied Upon

Applicant acknowledges that Zhou et al. (U.S. Patent No. 6,017,826), Trapp et al. (U.S. Patent No. 6,451,705) and Wang et al. (U.S. Patent No. 6,127,278) have been made of record and have been noted by the Office Action to be pertinent to Applicant's disclosure, yet were not relied upon in making any rejection. Applicant has reviewed these references and does not find them to be any more relevant than references already of record.

CONCLUSION

In view of the above remarks, Applicant respectfully submits that all claims are in condition for allowance and requests reconsideration of the application and allowance of claims.

The Examiner is invited to contact Applicant's representative to discuss any questions that may remain with respect to the present application.

Respectfully submitted,

Kevin G. Donohoe

By his Representatives,

Leffert Jay & Polglaze, P.A.
P.O. Box 581009
Minneapolis, MN 55458-1009
(612) 312-2204

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By _____

Thomas W. Leffert
Reg. No. 40,697